Abstract Criticism

Shreya Reddy

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1 Article 1

- **Title**: Constructive discrepancy minimization for convex sets
- **Abstract**:

  A classical theorem of Spencer shows that any set system with n sets and n elements admits a coloring of discrepancy `O(n^1/2)`. Recent exciting work of Bansal, Lovett and Meka shows that such colorings can be found in polynomial time. In fact, the Lovett-Meka algorithm finds a half integral point in any "large enough" polytope. However, their algorithm crucially relies on the facet structure and does not apply to general convex sets.

  We show that for any symmetric convex set K with measure at least exp(-n/500), the following algorithm finds a point y in K `\cap [-1,1]^n` with Omega(n) coordinates in -1,+1: (1) take a random Gaussian vector x; (2) compute the point y in K `\cap [-1,1]^n` that is closest to x. (3) return y.

  This provides another truly constructive proof of Spencer's theorem and the first constructive proof of a Theorem of Giannopoulos.

1.1 Violations

- The abstract uses formulas(expressions and symbols).
- The abstract uses references to another article.
- LaTeX commands have been used in the abstract.
- The abstract makes a lot of claims.

1.2 Improvements/Revisions

- **Title**: Constructive Discrepancy Minimization for Convex Sets
- **Abstract**:

  The classical theorem of Spencer shows that any set system with number of sets and number of elements admits a coloring of discrepancy of a certain value.

  For any symmetric convex set with a certain measure, the following algorithm finds a point in the said convex set interesting with Omega(n) by taking a random Gaussian vector x and finding the point in the convex set which intersects with a certain coordinate, and returning y.

  As a result, this provides another truly constructive proof of Spencer's theorem and the first constructive proof of a Theorem of Giannopoulos. [2]

2 Article 2

- **Title**: `($2+\epsilon$)`-SAT is NP-hard
- **Abstract**:

  We prove the following hardness result for a natural promise variant of the classical CNF-satisfiability problem: Given a CNF-formula where each clause has width `$w$` and the guarantee that there exists an assignment satisfying at least `$g = \lceil \frac{w}{2}\rceil -1$` literals in each clause, it is NP-hard to find a satisfying assignment to the formula (that sets at least one literal to true in each clause). On the other hand, when `$g = \lceil \frac{w}{2}\rceil$`, it is easy to find a satisfying assignment via simple generalizations of the algorithms for `\textsc{$2$-Sat}`.

Viewing `\textsc{$2$-Sat} $\in \mathrm {P}$` as easiness of `\textsc{Sat}` when `$1$-in-$2$` literals are true in every clause, and NP-hardness of `\textsc{$3$-Sat}` as intractability of `\textsc{Sat}` when `$1$-in-$3$` literals are true, our result shows, for any fixed `$\eps > 0$`, the hardness of finding a satisfying assignment to instances of ``` ``\textsc{$(2+\eps)$-Sat}'' ``` where the density of satisfied literals in each clause is promised to exceed `$\frac{1}{2+\eps}$`.

We also strengthen the results to prove that given a uniform hypergraph that can be 2-colored such that each edge has perfect balance (at most `$k+1$` vertices of either color), it is NP-hard to find a 2-coloring that avoids a monochromatic edge. In other words, a set system with discrepancy `$1$` is hard to distinguish from a set system with worst possible discrepancy.

Finally, we prove a general result showing intractability of promise CSPs based on the paucity of certain “weak polymorphisms.” The core of the above hardness results is the claim that the only weak polymorphisms in these particular cases are juntas depending on few variables.

2.1 Violations

- The title contains symbols and LaTeX commands.
- The abstract uses acronyms
- The abstract uses formulas and LaTeX commands.
- The abstract contains the words ”we”, ”our”.
- The abstract contains multiple paragraphs.
- The abstract makes a lot of claims.

2.2 Improvements/Revisions

- **Title**: (2 + epsilon)-Sat Is NP-Hard
- **Abstract**:

  Results for a natural promise variant of the classical CNF-satisfiability problem, where each clause with a certain width guarantees that there exists an assignment satisfying at least a literal in each clause. It is NP-hard to find a satisfying assignment to the formula.

  On the other hand, when a clause satisfies a certain value, it is easy to find a satisfying assignment via simple generalizations of the algorithms for 2-SAT. When 1-in-2 literals are true in every clause, and NP-hardness of 3-SAT as intractability of Sat when 1-in-3 literals are true, the results, for any fixed epsilon thats greater than a certain value , the hardness of finding a satisfying assignment to instances of ”(2+epsilon)-SAT” where the density of satisfied literals in each clause is promised to exceed a certain value.

  The results to prove that given a uniform hypergraph that can be 2-colored such that each edge has perfect balance, it is NP-hard to find a 2-coloring that avoids a monochromatic edge. [1]

References

[1] Austrin, P., Håstad, J., and Guruswami, V. (2 + epsilon)- SAT is NP-Hard.

[2] Rothvoss, T. Constructive discrepancy minimization for convex sets.